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TI Spectroscopic Characteristics and Intermolecular Interactions of Thiophene/Phenylene Co-Oligomers in Solutions
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PB American Chemical Society
DT Journal
LA English
CC 36-5 (Physical Properties of Synthetic High Polymers)
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AB The electronic spectra of thiophene/phenylene co-oligomers were obtained in solns. and compared with those of oligothiophenes and oligophenylenes, as a class of organic semiconductors. The spectra are influenced by the mol. size and sequence arrangement of thiophene/phenylene chains. In the dilute regime (.apprx.10-5 M), monomer emissions prevail. The quantum efficiency of fluorescence emission of co-oligomers is 0.79 and 0.74, for 4,4'-bis(2-thienyl)biphenyl (T2P) and 1,4-bis(5-phenylthiophene-2-yl)benzene (AC5), resp. The exptl. data in the dilute regime were compared with results of quantum chemical calcns. at semiempirical levels. Intermol. interactions become increasingly important at higher concns. The spectroscopic characteristics in this regime were studied for 2,5-diphenylthiophene (P1T), 5,5'-diphenyl-2,2'-bithiophene (P2T), and 1,4-bis(2-thienyl)benzene (T1P). By increasing the concentration, the co-oligomers show well-structured emission that is red-shifted relative to the monomer emission bands. New absorption shoulders appear in the longer wavelength region due to intermol. interactions. These features are assigned to intermol. ground-state complexes with fully overlapped π - π groups. Besides the above spectral features, T1P exhibits a long tail toward .apprx.700 nm in the absorption spectra at higher concns. and a broad emission band around 520 nm replaces the strong band at 450 nm. These features are assigned to intermol. charge-transfer from a thiophene to a phenylene ring. The fluorescence emission of co-oligomer thin films are also red-shifted relative to the monomer emission. The origin of these emissions in the solid state was also studied. The oligomers and corresponding conducting polymers are of interest for use in electronic and photonic devices.
ST thiophene phenylene oligomer electronic excitation chain sequence; fluorescence emission thiophene phenylene oligomer soln concn; conjugation chain electron transfer polythiophene polyphenylene; conducting polymer thiophene phenylene oligomer fluorescence
IT Polymers, properties
RL: PRP (Properties)
(conjugated; electronic excitation and mol. sequence and concentration effects
on absorption and emission spectra of thiophene/phenylene oligomers in solution)
IT Charge transfer interaction
Conducting polymers
Electronic excitation
Fluorescence
UV and visible spectra
(electronic excitation and mol. sequence and concentration effects on absorption and emission spectra of thiophene/phenylene oligomers in solution)
IT Polyphenyls
RL: PRP (Properties)

(oligomeric; electronic excitation and mol. sequence and concentration effects
on absorption and emission spectra of thiophene/phenylene oligomers in solution)

IT Polymers, properties
RL: PRP (Properties)
(polythiophenes, oligomeric; electronic excitation and mol. sequence and concentration effects on absorption and emission spectra of thiophene/phenylene oligomers in solution)

IT Polymer chains
(sequence and conjugation length; electronic excitation and mol. sequence and concentration effects on absorption and emission spectra of thiophene/phenylene oligomers in solution)

IT 1445-78-9, 2,5-Diphenylthiophene 1665-32-3, 5,5''-Diphenyl-2,2':5'2''-terthiophene 23354-94-1, 1,4-Bis(2-thienyl)benzene 83495-30-1, 5,5''-Diphenyl-2,2'-bithiophene 109359-51-5 238397-96-1 238397-97-2, 5,5'''-Diphenyl-2,2':5',2''':5'',2'''-Quaterthiophene 256342-39-9
RL: PRP (Properties)
(electronic excitation and mol. sequence and concentration effects on absorption and emission spectra of thiophene/phenylene oligomers in solution)

IT 25190-62-9, Poly(p-phenylene) 25233-34-5, Polythiophene
RL: PRP (Properties)
(oligomeric; electronic excitation and mol. sequence and concentration effects
on absorption and emission spectra of thiophene/phenylene oligomers in solution)

RE.CNT 65 THERE ARE 65 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

(1) Abe, J; J Am Chem Soc 1996, V118, P4705 CAPLUS
(2) Akimichi, H; Appl Phys Lett 1991, V58, P1500 CAPLUS
(3) Antolini, L; Adv Mater 1998, V10, P382 CAPLUS
(4) Athouel, L; Synth Met 1993, V55-57, P4734
(5) Athouel, L; Thin Solid Films 1996, V274, P35
(6) Bastiansen, O; Acta Chem Scand 1949, V3, P408 CAPLUS
(7) Baudour, J; Acta Crystallogr B 1978, V34, P625
(8) Bauerle, P; Adv Mater 1993, V5, P879
(9) Becker, R; J Phys Chem 1996, V100, P18683 CAPLUS
(10) Bredas, J; J Am Chem Soc 1983, V105, P6555 CAPLUS
(11) Chen, R; Anal Biochem 1967, V19, P374 CAPLUS
(12) Chosrovian, H; Synth Met 1993, V60, P23 CAPLUS
(13) Dicesare, N; J Phys Chem A 1999, V103, P3864 CAPLUS
(14) Dicesare, N; J Phys Chem A 1999, V103, P795 CAPLUS
(15) Dicesare, N; J Phys Chem A 1999, V103, P803 CAPLUS
(16) Drushel, H; Anal Chem 1963, V35, P2166 CAPLUS
(17) Egelhaaf, H; J Mol Struct 1993, V293, P249 CAPLUS
(18) Egelhaaf, H; Synth Met 1993, V61, P143 CAPLUS
(19) Era, M; Appl Phys Lett 1995, V67, P2430 CAPLUS
(20) Ferguson, J; J Chem Phys 1966, V44, P2677 CAPLUS
(21) Fichou, D; Adv Mater 1997, V9, P1178 CAPLUS
(22) Fichou, D; Organic Materials for Nonlinear Optics 1989, P177
(23) Fichou, D; Synth Met 1992, V48, P167 CAPLUS
(24) Garcia, P; J Phys Chem 1993, V97, P513 CAPLUS
(25) Geiger, F; Adv Mater 1993, V5, P922 CAPLUS
(26) Grebner, D; J Phys Chem 1995, V99, P16991 CAPLUS
(27) Hamano, K; Jpn J Appl Phys 1994, V33, P11031 CAPLUS
(28) Hizal, G; Polymer 1994, V35, P2428 CAPLUS
(29) Holmes, A; Synth Met 1993, V55-57, P4031
(30) Horowitz, G; Solid State Commun 1989, V72, P381 CAPLUS
(31) Hotta, S; Adv Mater 1993, V5, P896 CAPLUS

- (32) Hotta, S; Handbook of Organic Conductive Molecules and Polymers; Chapter 8
1997, V2
- (33) Hotta, S; J Heterocyclic Chem In press 2000
- (34) Hotta, S; J Mater Chem 1991, V1, P835 CAPLUS
- (35) Hotta, S; Macromolecules 1987, V20, P212 CAPLUS
- (36) Hotta, S; Synth Met 1999, V101, P551 CAPLUS
- (37) Huang, H; Macromolecules 1996, V29, P3485 CAPLUS
- (38) Jacques, P; J Phys Chem 1981, V85, P473 CAPLUS
- (39) Karg, S; Synth Met 1993, V55-57, P4186
- (40) Lee, S; J Polym Sci, Polym Phys Educ 1998, V36, P1433 CAPLUS
- (41) Lee, S; Synth Met 1999, V106, P39 CAPLUS
- (42) Louarn, G; Synth Met 1993, V55-57, P4672
- (43) Maruo, K; Bull Chem Soc Jpn 1992, V65, P3439 CAPLUS
- (44) Mataga, N; Molecular Interactions and Electronic Spectra 1970
- (45) Matsuoka, S; J Phys Chem 1991, V95, P5802 CAPLUS
- (46) Mitsuhara, T; J Chem Soc, Chem Commun 1987, P764 CAPLUS
- (47) Muguruma, H; Chem Mater 1998, V10, P1459 CAPLUS
- (48) Musick, K; Macromolecules 1998, V31, P2933 CAPLUS
- (49) Nicol, M; J Chem Phys 1973, V58, P4350 CAPLUS
- (50) Noda, T; Adv Mater 1997, V9, P720 CAPLUS
- (51) Noda, T; Appl Phys Lett 1997, V70, P699 CAPLUS
- (52) Parker, C; Analyst 1960, V85, P587 CAPLUS
- (53) Prasad, P; Introduction to Nonlinear Optical Effects in Molecules and Polymers 1991
- (54) Rentsch, S; Synth Met 1993, V55-57, P4740
- (55) Roth, S; Synth Met 1993, V55-57, P3623
- (56) Siegrist, T; Adv Mater 1998, V10, P379 CAPLUS
- (57) Stewart, J; J Comput Chem 1989, V10, P209 CAPLUS
- (58) Thienpont, H; Phys Rev Lett 1990, V65, P2141 CAPLUS
- (59) Varsanyi, G; J Chem Soc, Perkin Trans 2 1982, P761 CAPLUS
- (60) Viallat, A; Polymer 1994, V35, P2730 CAPLUS
- (61) Warren, J; Thin Solid Films 1989, V179, P515 CAPLUS
- (62) Willander, M; Synth Met 1993, V55-57, P4099
- (63) Wintgens, V; J Phys Chem 1994, V98, P228 CAPLUS
- (64) Yanagi, H; Appl Phys Lett 1997, V71, P2563 CAPLUS
- (65) Yassar, A; J Phys Chem 1995, V99, P9155 CAPLUS
- IT 109359-51-5
- RL: PRP (Properties)
(electronic excitation and mol. sequence and concentration effects on absorption and emission spectra of thiophene/phenylene oligomers in solution)
- RN 109359-51-5 CAPLUS
- CN Thiophene, 2,2'-[1,1'-biphenyl]-4,4'-diylbis- (CA INDEX NAME)

